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THREE NEW SPECIES AND NOTES ON THE GENUS *DRIESSENIA* KORTH.

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ABSTRACT

The paper presents a description of three new species of *Driessenia* Korth. viz. *Driessenia inaequalifolia* Nayar, *D. kemoelensis* Nayar and *D. ohwiana* Nayar. A new variety *Driessenia inaequalifolia* Nayar var. *alata* Nayar is also proposed. *D. ciliata* Becc. ex Cogn. has been reduced to *D. axantha* Korth.; likewise *D. ferox* Bakh. f. has been reduced to *D. glanduligera* Stapf.

Driessenia Korth. in Temminck, Verhand. Nat. Gesch. 251, 1844; Naudin in Ann. Sc. Nat. ser. 3, 15: 283, 1851; Miquel, Fl. Ned. Ind. 1: 537, 1855; Bentham & Hooker, Gen. Plant. 1: 753, 1865; Triana in Trans. Linn. Soc. 28: 73, 1871; Boerlage, Handl. Fl. Ned. Ind. 1: 510, 1890; Cogniaux in DC., Monogr. Phan. 7: 475, 1891; Gilg in Engl. u. Prantl, Die Nat. Pfl. Fam. 3, 7: Nachtr. 1, 264, 1897; Bakh. f. in Meded. Bot. Mus. & Herb. Rijks. Univ. 91: 241, 1943.

Herbs or undershrubs. *Branches* subterete, subquadrangular or quadrangular, puberulous, pilose or glandular. *Leaves* opposite, subequal or unequal, ovate-oblong, ovate or lanceolate, base subcordate, cuneate or oblique, apex acuminate, glabrous or hirsute, petiolate or subsessile. Inflorescence axillary, in panicles or fascicles, hirsute, glandular and puberulous. *Flowers* 4-merous, pedicellate, bracts small. *Calyx tube* campanulate, angular or subterete, puberulous, hirsute, usually glandulose, limb 4-dentate. *Petals* 4. *Stamens* 8, subequal or unequal, filament present, anther oblong or oblong-lanceolate, 1-porose, connective hardly produced, dorsally ends in a short or prominent spur, ventrally ends in two linear appendages. *Ovary* concrescent with the calyx tube by 8 septa, extra-ovarial chambers present, descending to the upper ¼ or to the middle of the ovary, disc present, lobes indentate. *Style* filiform, glabrous, stigma hardly conspicuous. Capsule widened at the top, quadrangular or subterete, dehiscence by four valves. Seeds many, minute, semiovoid.

Type: Driessenia axantha Korth.

Korthals (1844, *l.c.*) described the genus *Driessenia* on the basis of *Driessenia axantha* Korth. typified by *Korthals* s.n. from 'G. Prarawin' Borneo. Naudin (1851, *l.c.*), Miquel (1855, *l.c.*), Bentham & Hooker (1865, *l.c.*) accepted Korthal's genus. Cogniaux (1891, *l.c.*) besides accepting *D. axantha* Korth., described two additional species *D. teysmannii* Cogn. and *D. ciliata* Becc. ex Cogn. Stapf (in Hook. f., Ic. Pl. 23: t. 2291 & 2292, 1894) erected two species *D. glanduligera* and *D. microthrix* both from Borneo. Besides, Stapf (in Hook. f., Ic. Pl. 25: t. 2414, 1895) proposed the Sect. *Scorpioides* for accommodating *D. scorpioidea* Stapf and *D. crystallina* Stapf and thus widened the generic concept. In so doing he failed to evaluate the nature of ventral appendages and the presence of 4-celled glands in *D. scorpioidea* and *D. crystallina* as they are profound departures from Korthal's original conception of the genus.

The genus *Driessenia* is delimited by the dorsally spurred and ventrally bisetose or biappendiculate connective, a capsule which is widened at the apex and by the presence of an ovarial disc.

There are about 8 species confined to Borneo and Celebes and of which 7 are endemic to Borneo. *Driessenia glanduligera* Stapf is recorded both from Borneo and Celebes. The genus is named in honour of den Hoogleeraar Driessen, Vroeger eem sieraad den Groningsche Hoogeschool.

Driessenia inaequalifolia Nayar sp. nov. (Fig. 1).

A ceteris speciebus differt, foliis manifeste inaequalibus vel subsessilibus.

Frutex. *Rami* subquadrangulares vel subteretes, furfuracei. *Folia* opposita, inaequalia, lanceolata vel oblongo-lanceolata; folia maiora 14-16 cm longa, 3-3.5 cm lata, basi obliqua, apice acuminata, supra parce puberula, subtus ad nervos furfuracea, 5-nervia, venulis transversis distinctis reticulatis, subcoriacea, petiolus 2-3 mm longus, furfuraceus; folia minora 1-1.5 cm longa, 0.4-0.5 cm lata, sessilia vel

subsessilia. *Inflorescentia* axillaris, fasciculata, 2-4 flora ; bracteolae lineares, 0.8 mm longae ; pedicellus 2-3 mm longus, puberulus. *Calycis tubus* campanulatus, 3-4 mm longus, puberulus, limbus 4 lobatus, lobis triangularibus 2-2.5 mm longis. *Petala* 4, ovato-oblonga, 8 mm longa, 5 mm lata. *Stamina* 8, subaequalia, filamentis 3 mm longis, antheris 4 mm longis, connectivo dorso in calcar 1 mm longum

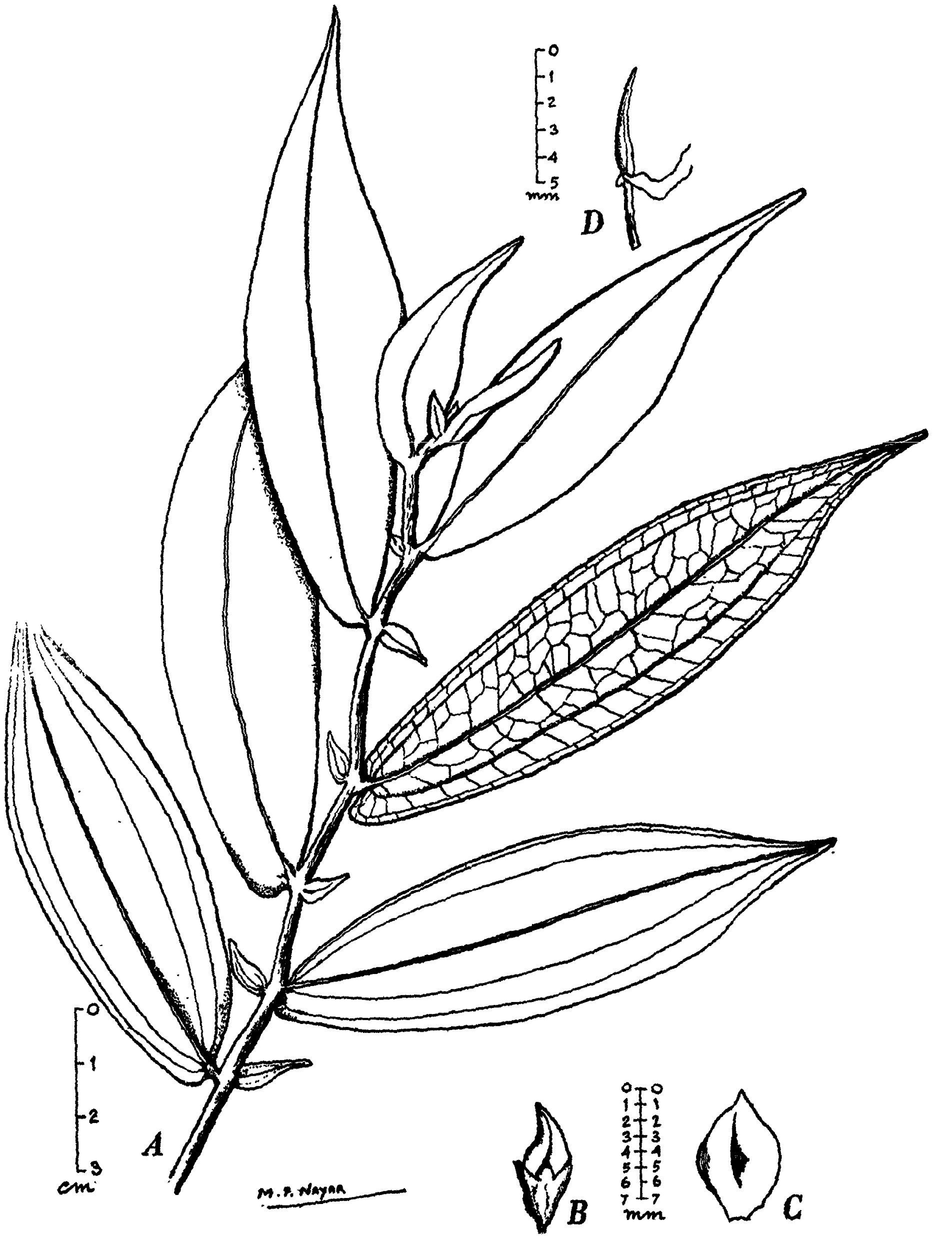

Fig. 1. *Driessenia inaequalifolia* Nayar sp. nov.
A. Habit. B. Flower bud. C. Petal. D. Stamen.

exeunte, in parte ventrali in appendices duos lineares 3.5 mm longos exeunte. *Ovarium* calycis tubo septis 8 adnatum, loculi 8, usque ad medium ovarii prolongati, coronatum, lobis minute denticulatis. *Stylus* 6-7 mm longus, sparse puberulus.

Typus : Anderson 4222 (Holotypus K, Isotypus L).

Shrub. *Branches* subquadrangular or subterete, furfuraceous. *Leaves* opposite, unequal, lanceolate or oblong-lanceolate; large leaves 14-16 cm long, 3-3.5 cm wide, base oblique, apex acuminate, uppersurface sparsely puberulous, undersurface along the nerves furfuraceous, 5-nerved, transverse venules distinct and reticulate, subcoriaceous, petiole 2-3 mm long, furfuraceous; small leaves 1-1.5 cm long, 0.4-0.5 cm wide, sessile or subsessile. *Inflorescence* axillary, fasciculate, 2-4 flowers; bracteole linear, 0.8 mm long; pedicell 2-3 mm long, puberulous. *Calyx tube* campanulate, 3-4 mm long, puberulous, limb 4-lobed, lobes triangular 2-2.5 mm long. *Petals* 4, ovate-oblong, 8 mm long, 5 mm wide. *Stamens* 8, subequal, filament 3 mm long, anther 4 mm long, connective dorsally ends in 1 mm long spur and ventrally ends in two linear appendages which are 3.5 mm long. *Ovary* adnate to the calyx tube by 8 septa, extra-ovarial chambers 8 descending to the middle of the ovary, disc present, lobes minutely denticulate. *Style* 6-7 mm long, sparsely puberulous.

Distribution : BORNEO: Sarawak, Baram Dist., G. Mulu, Path from Melinau Paku, alt. 1400 m, 28 June 1961, *Anderson* 4222 (Holotype K, Isotype L).

Driessenia inaequalifolia Nayar var. **alata** var. nov.

A planta typica ramis quadrangularibus et alatis differt.

Typus : R.S.N.B. No. 102 (Holotypus K).

Distribution : BORNEO: Sabah, Mt. Kinabalu, alt. 1166 m, 17 June 1961, *R.S.N.B.* No. 102 (K); *Ibid.*, Singh's Plateau, alt. 1000 m, 12 June 1961, *R.S.N.B.* No. 1017 (K); *Ibid.*, Dallas, alt. 1000 m, 5 Nov. 1931, *J. & M. S. Clemens* 26941 (K, L); *Ibid.*, 17 Aug. 1931, *J. & M. S. Clemens* 26115 (K, L); Mt. Kinabalu, Tenompak, alt. 1666 m, 25 Jan. 1932, *J. & M. S. Clemens* 28031 (K); SARAWAK: Gunong Leuabok, alt. 1333 m, 9 Nov. 1920, *Moulton* 6773 (K); INDONESIAN BORNEO: Balikpapan, 25 July 1954, *Kostermans* 9824 (K, L); Nunukan, S. Menbunut Besar, 20 Nov. 1953, *Meijer* 2290 a (L); North of Tarakan, near S. Binusan, 6 Dec. 1953, *Meijer* 2435 (L).

This variety differs from the type in having winged branches. There is good deal of variation in the degree of pubescence.

Driessenia kemoelensis Nayar sp. nov. (Fig. 2).

Affinis *D. glanduligerae* Stapf, sed indumento dense glanduloso, ramis foliisque velutino-pilosis differt.

Rami subteretes, dense glanduloso-villosi. *Folia* ovata, 8-13 cm longa, 5-7 cm lata, basi cordata vel subcordata, apice acuminata, supra furfuracea, subtus dense glanduloso-velutina, 9-nervia, subtus venulis transversis distinctis reticulatis, chartacea; petiolus 3-13 cm longus, dense glanduloso-pilosus. *Inflorescentia* paniculata, axillaris, 3-5 cm longa, dense glanduloso-velutina; pedunculus 1-1.5 cm longus; pedicellus 4-6 mm longus. *Calycis tubus* campanulatus, 2-2.5 mm longus, dense glanduloso-pilosus, limbus 4-dentatus, dentibus linearibus 2.5 mm longis, glanduloso-pilosis. *Petala* 4, ovato-oblonga, 6-8 mm longa. *Stamina* 8, subaequalia, filamentis 2-2.5 mm longis, antheris 2.5-3 mm longis, connectivo dorso in calcarem 1.5 mm longum exeunte, in parte ventrali in appendices lineares duos 2.5-3.5 mm longos exeunte. *Ovarium* calycis tubo septis 8 adnatum, loculi 8, usque ad medium ovarii prolongati, coronatum, lobis minute denticulatis. *Stylus* 4.5 mm longus, glaber, stigmate punctiformi.

Typus : Endert 3807 (Holotypus K, Isotypus L).

Branches subterete, densely glandulose hairy. *Leaves* ovate, 8-13 cm long, 5-7 cm wide, base cordate or subcordate, apex acuminate, upper surface furfuraceous, undersurface densely glandulose velutinous, 9-nerved, transverse venules on the undersurface distinct and reticulate, chartaceous; petiole 3-13 cm long, densely glandulose pilose. *Inflorescence* paniculate, axillary, 3-5 cm long, densely glandulose velutinous; peduncle 1-1.5 cm long. *Calyx tube* campanulate, 2-2.5 mm long, densely glandulose pilose, limb 4-dentate, lobes linear 2.5 mm long, glandulose pilose. *Petals* 4, ovate-oblong, 6-8 mm long. *Stamens* 8, subequal, filament 2-2.5 mm long, anther 2.5-3 mm long, connective dorsally ending in 1.5 mm long spur and ventrally ends in two 2.5-3.5 mm long linear appendages. *Ovary* concrescent with the calyx tube by 8 septa, extra-ovarial chambers 8, all descending to the middle of the ovary, disc present, lobes minutely denticulate. *Style* 4.5 mm long, glabrous, stigma punctiform.

Distribution : BORNEO: INDONESIAN BORNEO: W. Koetai, Mt. Kemoel, alt. 1000 m, 4 Oct. 1925, *Endert* 3807 (Holotype K, Isotype L); *Ibid.*, alt.

1500 m, 12 Oct. 1925, *Endert* 3938 (L); *Ibid.*, alt. 1200 m, 26 Sept. 1925, *Endert* 3568 (L).

Driessenia glanduligera Stapf in Hook. Ic. Pl. 23: t. 2291, 1894; Merrill in Journ. Str. Br. Roy. As. Soc. 1921. Spec. No. 439, 1921. (Type: *Haviland* 1174) *Driessenia ferox* Bakh. f. in Meded. Bot. Mus. & Herb. Rijks. Univ. No. 91, 242, 1943. *Synon. nov.* (Type: *Rachmat* 585).

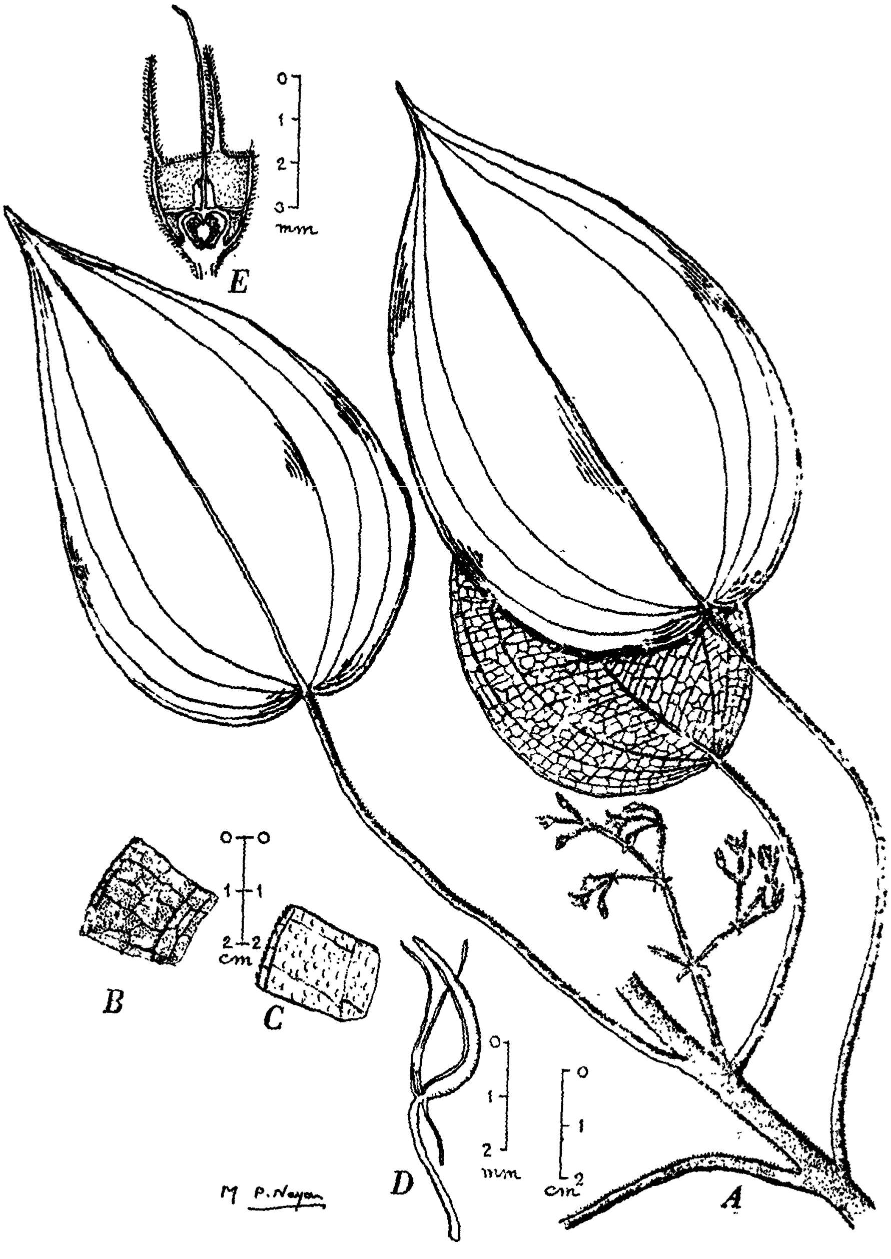

Fig. 2. *Driessenia kemoelensis* Nayar sp. nov.
A. Habit. B. Portion of leaf (lower surface). C. Portion of leaf (upper surface). D. Stamen—side view. E. L. S. of calyx tube.

Driessenia glanduligera is characterised by the presence of dense glandular hairs in the stem, petiole and inflorescence. There is a great deal of variation in the length of the inflorescence axis and in the specimens *Richards* 1304 and *Synge* 362 the peduncle is very short.

According to Bakh. f. (in Meded. Bot. Mus. & Herb. Rijks. Univ. No. 91, 242, 1943) *D. ferox* differs from *D. glanduligera* by "its habit, the great number of nerves on the leaves and by the presence of a disc." The ovarial disc is present in both *D. glanduligera* and *D. ferox*. Bakh. f.'s *D. ferox* perfectly matches *D. glanduligera* Stapf.

Distribution: BORNEO: SABAH: Kinabalu, alt. 1666 m, *Haviland* 1174 (K, BM); *Ibid.*, Tenompok, alt. 1666 m, 30 Apr. 1932, *J. & M. S. Clemens* 29456 (K); *Ibid.*, alt. 1666 m, 16 Mar. 1932, *J. & M. S. Clemens* 30386 (K, L); *Ibid.*, 26 Apr. 1932; *J. & M. S. Clemens* 30385 (K, L); *Ibid.*, 26 Jan. 1932, *J. & M. S. Clemens* 28181 (BM, L, K); *Ibid.*, *J. & M. S. Clemens* 28221 (BM, K, L); *Ibid.*, alt. 1500 m, 22 Aug. 1961, *R.S.N.B.* No. 1347 (K); *Ibid.*, *R.S.N.B.* No. 109 (K); *Ibid.*, alt. 1666 m, 31 July 1961, *R.S.N.B.* No. 1579 (K); SARAWAK: Bukit Mayeng, alt. 500 m, 5 June 1956, *Purseglove* P. 5373 (K, L); Mt. Dulit, near Long Kapa, alt. under 300 m, 16 Aug. 1932, *Richards* 1304 (K); *Ibid.*, alt. 566 m, 30 Aug. 1932, *Synge* 362 (K, L); Bt. Mersing, Ulu Anap. alt. 1000 m, 5 Oct. 1963, *Ashton S.* 17690 (K); CELEBES: G. Bilisang, *Rachmat* 585 (L).

Driessenia axantha Korth. in Temminck, Verhand. Nat. Gesch. 251, t. 53, 1844; Blume in Mus. Bot. Lugd.-Bat. 1: 13, 1849; Naudin in Ann. Sc. Nat. ser. 3, 15: 283, 1851; Miquel, Fl. Ned. Ind. 1: 537 (1855); Triana in Trans. Linn. Soc. 28: 73, t. 64, 1871; Boerlage, Handl. Fl. Ned. Ind. 1: 531, 1890; Cogn. in DC., Monogr. Phan. 7: 475, 1891; Krasser in Engl. & Prantl, Pflanzen. 3, 7: 169, t. 744, 1893; Bakh. f. in Meded. Bot. Mus. & Herb. Rijks. Univ. 91: 242, 1943. (Type: *Korthals* s.n. L).

Driessenia ciliata Becc. ex Cogniaux in DC., Monogr. Phan. 7: 476, 1891; Merrill in Journ. Str. Br. Roy. As. Soc. 1921: spec. no. 439, 1921. *Synon. nov.* (Type: *Beccari* 2333, Isotype K).

Distribution: BORNEO: Mt. Prarawin, *Korthals* s.n. (L); SARAWAK: May 1872, *Beccari* 2333 (K); Gunong Peuh, alt. 833 m, 23 Sept. 1955, *Purseglove & Shah* P. 4699 (K).

Driessenia microthrix Stapf in Hook. Ic. Pl. 23: t. 2292, 1894.

Distribution: BORNEO.

Additional material: SARAWAK: Mt. Dulit, near Long Kapa, alt. c. 600 m, 27 Aug. 1932, *Richards* 1485 (K, L); *Ibid.*, *Richards* 1097 (K); *Ibid.*, alt. c. 566 m, 30 Aug. 1932, *Synge S.* 361 (K, L); Singei Mayeng, Tau Range, alt. c. 233 m, 4 June 1956, *Purseglove* P. 5341 (K, L); Bt. Bersing, Ulu Anap, 5 Oct. 1963, *Ashton S.* 19160 (K, L); SABAH: Mt. Kinabalu, Dallas, alt. 1000-1666 m, Sept. 1931, *J. & M. S. Clemens* 26624=26068 (BM, K); Penibukan, alt. 1333 m, *J. & M. S. Clemens* 31025 (BM, K, L); Mt. Numkok, alt. 833 m, 22 Apr. 1933, *J. & M. S. Clemens* 31628=32899 (BM); Eastern shoulder, alt. 833 m, 13 Jun. 1961, *R.S.N.B.* No. 578 (K); INDONESIAN BORNEO: W. Koetai, No. 36, near L. Petah, alt. c. 450 m, 16 Sept. 1925, *Endert* 3362 (K, L); *Ibid.*, No. 29, near L. Liah Leng, alt. c. 250 m, *Endert* 3000 (L).

Driessenia minutiflora O. Schwartz in Mitt. Inst. Bot. Hamburg Bd. 7. Heft 3: 238, 1931.

Type: Borneo, *Winkler* 612 (Holotype HMG).

This species is quite allied to *D. microthrix* Stapf, but differs in having long petiolate (5-10.5 cm long) ovate leaves with subcordate base; whereas in *D. microthrix* the leaves are ovate-oblong or oblong with cuneate base and shortly petiolate. (Petiole 0.8-1.2 cm long).

Driessenia ohwiana Nayar sp. nov. (Plate I).

Arcte affinis *D. glanduligerae* Stapf, sed foliis mionribus ellipticis, petiolis brevioribus, floribus, minoribus, calycis-lobis triangularibus indumento dense glanduloso differt.

Herba. *Rami* subangulati, dense glanduloso-setoso-pilosi, setis 0.5 mm longis. *Folia* subaequalia, ovato-elliptica vel elliptica, 5-10 cm longa, 2.4-4.5 cm lata, basi obtusa vel subrotunda, apice acuminata, supra farinosa, subtus ad nervos dense pilosa, inter nervos sparse pilosa, 7-nervia, venulis transversis subtus distinctis, supra venulis indistinctis, membranacea; petiolus 0.8-2.5 cm longus, dense glanduloso pilosus et longi setosus, setis 7-10 mm longis. *Inflorescentia* terminalis, paniculata, 4-8 cm longa, dense glanduloso-furfuracea. *Bracteae* lineares 1.5-1.8 mm longae; pedicellus 1-2 mm longus, dense glanduloso-furfuraceus. *Calycis tubus* campanulatus, 1.5-2 mm longus, dense glanduloso-hirsutus; limbus 4 dentatus, dentibus triangularibus 0.5-0.8 mm longis. *Petala* 4, ovato-oblonga, 3-3.5 mm longa, 1.5-2 mm lata, alba (teste collectore). *Stamina* 8, subaequalia, filamentis 2 mm longis, antheris oblongis vel oblongo-lanceolatis, 2-2.5 mm longis, connectivo non producto, dorso in calcarem 0.4 mm longum exeunte, in parte ventrali in appendices duos lineares 1.5-2 mm longos exeunte. *Ovarium* calycis tubo septis 8 adnatum, coronatum. *Stylus* filiformis, 2.5 mm longus, stigmate punctiformi. *Capsula* ignota.

Typus : F. H. Endert 4007 (Holotypus L, Isotypus K).

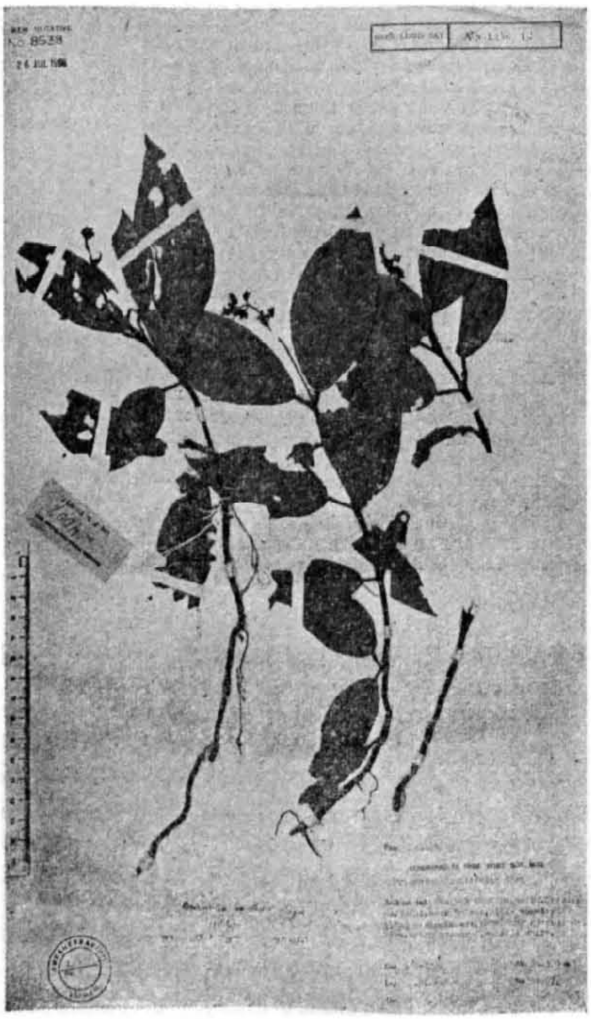

Plate I: *Driessenia ohwiana* Nayar (Endert 4007—Holotype).

Herb. *Branches* subangulate, densely glandulose and setose pilose, hairs 0.5 mm long. *Leaves* subequal, ovate-elliptic or elliptic, 5-10 cm long, 2.4-4.5 cm wide, base obtuse or subrotund, apex acuminate, upper surface farinose, lower surface along the nerves pilose, in between the nerves sparsely pilose, 7-nerved, undersurface venules distinct, upper surface venules indistinct, membranaceous; petiole 0.8-2.5 cm long, densely glandulose pilose with 7-10 mm long bristles. *Inflorescence* terminal, paniculate, 4-8 cm long, densely glandulose furfuraceous. *Bract* linear, 1.5-1.8 mm long; pedicel 1-2 mm long, densely glandulose furfuraceous. *Calyx tube* campanulate, 1.5-2 mm long, densely glandulose hirsute, limb 4 dentate, lobes triangular 0.5-0.8 mm long. *Petals* 4, ovate-oblong, 3-3.5 mm long, 1.5-2 mm wide, white (ex collector). *Stamens* 8, subequal, filament 2 mm long, anther oblong or oblong-lanceolate, 2-2.5 mm long, connective not produced, dorsally ends in 0.4 mm long spur and ventrally ends in two 1.5-2 mm long linear appendages. *Ovary* concrescent with the calyx tube by 8 septa, disc present. *Style* filiform, 2.5 mm long, stigma punctiform. *Capsule* not seen.

Distribution : BORNEO: INDONESIAN BORNEO: W. Koetai, No. 30/31, near Bolset, alt. c. 300 m, 3 Sept. 1925, *F. H. Endert* 4007 (K, L); *Ibid.*, near L. Petah, alt. 450 m, 16 Sept. 1925, *F. H. Endert* 3343 (L); *Ibid.*, 15 Sept. 1925, *F. H. Endert* 3306 (L).

D. ohwiana Nayar is closely allied to *D. glanduligera* Stapf but differs in having densely glandular pilose branches and inflorescence, leaves smaller and elliptic (5-10 cm × 2.4-4.5 cm), shorter petioles (0.8-2.5 cm long), smaller flowers and smaller calyx tube (1.5-2 mm long) with triangular calyx lobes (0.5-0.8 mm long). Whereas in *D. glanduligera* the inflorescence and branches are less glandulose hairy, the leaves are larger and ovate (8-25 cm × 3-12 cm) with long petioles (5-17 cm long) and the flowers are larger with longer calyx tube (2.5 mm long) and linear calyx lobes (2-2.5 mm long).

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